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ABSTRACT

The report describes a project to implement a cluster curriculum in the graphic communications and metals clusters in an area vocational high school setting. A flexible curriculum allowed for the development of competencies common to all trade areas within the cluster. The material was organized into 10-week units of instruction to be completed at the individual student's own pace. Skill mastery sheets were developed for grading purposes. Year end reports for each of the clusters are appended to the report. In the graphic communications area students were given "hands-on" experiences in the four printing shops of offset pressroom, offset preparation, letterpress, linotype and hand composition and make up. In the metals cluster area, students were also offered the opportunity to attend shops outside their original area. Appended are general information about the cluster curriculum and the skill mastery check sheets for each cluster. (NJ)

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FINAL REPORT

IMPLEMENTATION OF THE CLUSTER CONCEPT IN TWO VOCATIONAL AREAS IN AN AREA VOCATIONAL-TECHNICAL SCHOOL SETTING
(Project No. 20:5004)

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July 7, 1975

PENNSYLVANIA DEPARTMENT OF EDUCATION

BUREAU OF VOCATIONAL EDUCATION

REASEARCH COORDINATING UNIT

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IMPLEMENTATION OF THE CLUSTER CONCEPT IN TWO VOCATIONAL AREAS IN AN AREA VOCATIONAL-TECHNICAL SCHOOL SETTING

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INTRODUCTION

This project was intended to revitalize the vocational education program by implementing a curriculum that can be used by all area vocational-technical schools in the Philadelphia area. This project utilized a cluster curriculum that will best prepare our students for a technological society which is ever changing and thus requires a variety of skills which relate to a cluster of occupations. Each component of the program worked in concert with and utilized the resources of specific programs and agencies in the vicinity of the metropolitan area which share related objectives and activities or which have something to offer to vocational education. Methods of disseminating the various kinds of outputs produced by these activities to other projects which could benefit from the information were devised.

Students that have expressed an interest in the metals or graphic-communications areas were selected to participate in the cluster program. They were given individualized instruction in a skills development program during their 10th grade year. Students had the opportunity to develop salable skills in a variety of vocational areas, within a cluster, that will enhance their employability.

The objectives of the cluster implementation program at the Area Vocational School will be the following:

a. To allow further exploration, within a cluster, beyond the ninth grade level.

b. To provide skill development in the graphic communications, and metals clusters.

c. To provide a flexible curriculum within a cluster area in which a student will be able to choose an area of specialization after he/she has developed compentencies in all the trade areas within the cluster.

d. To provide students with the kinds of experiences most likely to help him promote his career by decreasing time periods needed for initial or retraining.

e. To implement those two clusters which provides more relevance for students interested in a variety of occupations instead of a specific job with the use of individualized instructional programs.

It is assumed that the students who are involved in this type of program will be better prepared to meet the

demand of employment in our ever changing technological society in contrast to those students, who are participants in a traditional three year vocational program.

At the secondary level, attention was directed to changing concepts of skill development which encompass the development of occupational clusters and individualized instruction. During the tenth grade level, students whose career goals were consistent with the metals and graphic-communications cluster were selected to participate in skill development activities of this nature.

For students who elected the metals cluster, exposure to the following shops over a one year period with specialization taking place at a subsequent period did occur. Metal Cluster shops are foundry, welding (gas & electric), machine shop and sheet metal. Pupils in the tenth grade spent 10 weeks in each of the above shops. In the eleventh and twelfth grade pupils will have the opportunity to specialize for the full year in a shop of their choice within the cluster. Based on the job market and his career desires the pupil will then participate in a school work program which hopefully lead to full-time employment with his or her cooperative employer.

For students who elected the graphic-communications cluster exposure to the following shops over a one and one-half year period with specialization taking place at the subsequent period will occur. These shops are hand composition, letterpress, offset press, linotype, offset camera and commerical art. Pupils in the tenth grade spent 10 weeks in hand composition, 10 weeks in letterpress and 10 weeks in offset press, 10 weeks in linotype. In the eleventh grade, student will spend 10 weeks in offset camera and 10 weeks in commerical art, and 20 weeks in the shop of their choice. In the twelfth grade pupils will have the opportunity to specialize. Based on the job market and his or her career desires the pupil will increase his skills in the selected area for 40 weeks. The pupil will then participate in a school work program which will hopefully lead to full-time employment with his or her cooperative employer.

Students were enrolled for person-centered vocational training rather than stratified grade levels. The objective is to prepare for employment or further education. Guidance services included assessment, evaluation, placement services and follow-up.

FINDINGS & ANALYSIS

The implementation of this proposal required changes in the methods of teaching and evaluating the educational progress of the students within each cluster and their respective shop areas. The specific material within each shop area to be covered was determined by the cluster chairmen and "Skill Mastery Sheets" were developed for grading purposes. These sheets, were developed by the cluster chairmen and shop teachers involved, were approved by the administration of the Dobbins Area Vocational-techincal School. The instructors were given a copy of these sheets for each student in their cluster program. The skill mastery sheets stated: what was to be covered during the ten week period. The student was rostered to the class and successful or unsuccessful completion of the tasks was to be noted.

Using the skill mastery sheets as reference a method of instruction was utilized that provided enough material to sufficently cover the subject areas within the ten weeks alloted. This allowed for the cycling of instruction for each new group of students (without interfering with the regular vocational students in the class) and provided for individualized self-paced progress. The teachers were asked to suggest various methods that would accomplish the stated task objectives indicated by the Skill Mastery Sheet. Generally there were several approaches that were effective: 1) the use of individualized Audio-visual Sound on Slide curriculum material developed by the School District of Philadelphia; 2) use of textbooks within each shop area, supplemented by practical experience through projects; 3) the use of a peer teaching technique where a senior or advanced junior student assists a cluster student; 4) small group rostering giving the students themselves an opportunity to help each other; 5) small group discussion periods with the cluster chairperson. The most successful component was the implementation of the Sound on Slide curriculum material in the Sheet Metal Shops and Machine Shops. This material allowed the students involved to cover specific activities at their own pace and not require the attention of the instructor, except for questions and supplementary instructions. It should be noted theat the implementation of this material was limited to these two shops due to the unavailability of units for other shop areas within the Metals and Graphic-communications Clusters. The reaction to the individualized materials was favorable from the instructors and students involved. One of the teachers who had originaly expressed a hesitation for using the Sound on Slide units, became enthusiastic about their usefulness after using them.

The students for the cluster program were selected from tenth grade shops, rotated through four related shops, and asked for their shop selection for the specialization phase of the program in grades eleven and twelve. The final

selections of the students were found to be different from those shops originally selected in the ninth grade for the majority of the students. The reason given for the final selections was based upon a success factor within a particular shop and upon a realization on the part of the student of what the shop area was really about. Not only did the students feel that they had learned skills in each of the areas, but a better understanding of the specific trade options within a cluster area.

The changing of the structure of a vocational class room is difficult to say the least, but through the efforts of the cluster chairperson and the teachers involved this was accomplished. Much of the burden for the success of the program rested on the shoulders of the chairperson who performed many varied duties sach as student selection, rostering, small group discussion leader, curriculum organizer and facilitater, recording grades, trips and final shop placement.

CONCLUSIONS AND RECOMMENDATIONS

It was the opinion of the administration, teachers and students, who participated in the project, that a significant change in curriculum structure had taken place within the Area Vocational-technical School. This beneficial change has heightened the interest of the students throughout this school year. Infusing of the cluster concepts into an ongoing vocational school program has shown the difficulty encountered by teachers in having to conduct two programs at one time; i.e. traditional three (3) year program and the new ten (10) week cluster program. Teachers have individually developed and used curriculum materials in addition to those supplied by the project management. It is the opinion of the project management, that inservice time would have provided an opportunity for more indepth coordination of separate shop curricula. Student's comments were directed towards their pleasure in participating and exploring in different trade areas without being locked into only one shop. As has been noted in our findings many students have changed their original program selection due to this opportunity.

During the coming school year we hope to produce an outline for the Cluster Program that can be disseminated to other vocational schools that have an interest in adopting this approach. It has been stated by the pilot school administration that the project has a significant educational impact on their planning and curriculum development. There are plans now in progress to possibly expand the cluster technique to other vocational areas such as Business Education, Transportation, and Construction. The following recommendations for the ultimate success of this will be attempted during the coming school year:

1. To provide job placement and follow-up service for those students that have participated in this program. ("Job Getting" and "Job Keeping" ability of the cluster student vie a regular vocational school student)

2. To provide inservice training for all vocational teachers and counselors involved with the Cluster Program.

3. Production and dissemination of curriculum materials.

APPENDIX

GRAPHIC-COMMUNICATIONS CLUSTER
YEAR END REPORT

Since the majority of our tenth grade printing students have no idea of what the printing trade is about we changed our procedure for the Graphic-Communications Cluster this year. In the first year we asked for student volunteers who were interested in being a member of the cluster and held the number to fifteen. This year we made all our tenth graders part of the cluster. The number was now increased to forty-three (43). All students were given the opportunity to explore four different printing areas to see how these shops work together in the producing of the finished product. In each area the student was given an opportunity to have a hands-on experience in these different related fields. The shops included: Offset Pressroom, Offset Preparation, Letterpress, Linotype and Hand Composition and Make-up.

Entry level skills were learned by each student in each shop. This will give each student an opportunity for summer employment in any of the different areas he or she has explored. If for any reason one of the students must drop out of school during or after tenth grade they may be able to seek employment in an entry level of the printing field.

Meetings of the teachers in our cluster were held and we decided a theory class was needed for all our cluster students. Roster changes were made so two of our teachers could team-teach and handle this class. Included in the course of study were the following:

Printers' Math
Printers' English - Capitalization, punctuation, proofreading
Unionism
Printing Processes
Papers and Inks
Specialty Printing
Job Opportunities
How to find a job

Field trips have been taken to Weyerhouser Paper Company and the Philadelphia Bulletin. The interest of the students can be shown by the reports written by them after the trips.

The students were also given individual counseling in helping them make their choice which shop they will specialize in for eleventh and twelveth grades. The attached questionaire was given to the students to find any changes that have been made in their knowledge of the trade.

GRAPHIC-COMMUNICATIONS CLUSTER

During the year we are proud to say we have not had anyone drop out of the program. We have added a young man who transferred from Sheet Metal and one from Carpentry. Included in our program are sixteen young women.

Richard C. Krug
Chairman
Graphic-Communications Cluster

NAME _____

This year all 10th grade printing students have been a part of the Graphic Communications Cluster. I would like you to give your opinion on the following questions:

1. Did you have any idea what printing was before this year?

2. If you did know something about printing, what areas were new to you this year?

3. Did you change your choice of shop for 11th grade after being in the different shops?

4. What area of printing will you specialize in next year?

5. Do you feel you learned something new in each of the shops tried this year?

   If so, what did you learn in each?

6. If you dropped out of school this summer, do you feel you know enough to try to get a job in a print shop?

   What area of printing would you try?

7. Do you feel your first period theory class was or will be beneficial to you as a printer? Give a reason for your answer.

8. Do you feel you did the best you could in each shop?

YEAR END REPORT - METALS CLUSTER

The summary of activities concerning the Metals Cluster portion of our program for this year contains some unique and desirerable results. The activities of the program have steadily increased and broadened over the past year. The changes in process' and proceedures led the way to new thinking on the part of students and teachers which, in turn, fostered growth to all involved and improvement of the instructional aspects of the program.

The pupils who were part of the Metals Cluster Program this year seem to accept this unique from of learning and showed a positive and participating attitude. They attended shops other than their original areas with a curiosity that helped them a great deal to adopt. The programs which was offered to them in each of the shops related to one another and this allowed the students to see the significant values of their learning. They were quick to point out that a particular skill or knowledge was important to them because it would help them in making their final vocational choice.

This years activities provided information about trades to some who were unsure of their final decisions. Consequently, some students were more comfortable in the decision which they had originally made and others realized that there were areas to which they might better adopt and, therefore, made a change. This point can stand alone as a means of justification for this program.

The group or team of metal cluster instructors are reaching a seasoned level of performance. They have learned a great deal from their past experiences with this program and the students who are involved. Acceptance of and participation in these unique activities was a difficult task for people who were deeply seated in tradition. However, this year showed a welcomed and significant attitude change within the staff toward the program which brought them closer to a common ground on which to work as a team.

The closing activities of the staff for this year was a series of working sessions at the end of each school day. This time was spent consolidating the individu-l shop projects into a full semester curriculum to be followed by the cluster students during the 1975-76 school year. Printed information was initiated which will help the students evaluate the relationship of the project to one another; examinations were selected and the rostering of students for each rotation was formulated for a more solid

base on which to evaluate the performance of the participating learners.

The teachers of the Metals Cluster conclude that they have succeeded in the initial experimental stage of this program. This is not to say that there will be no further changes. On the contrary, they now know that their ideas, methods and attitudes must be open to change for improvement at any time. Again, a significant change has taken place and enhance the program so that it may grow and develop to the expectations of its founders.

Albert E. Newsham
Metals Cluster Chairman

3-17-75

TO: PROGRESS COMMITTEE & TRADE COORDINATORS

FROM: JOHN MAIER, PROGRESS COORDINATOR

SUBJECT: INFORMATION ON THE CLUSTER PROGRAM

At the tenth grade level students whose career goals are consistent with the metals, graphic commications and in the 11th grade level with business education clusters will participate in skill development activities of this nature. At the secondary level, attention will be paid to the changing concepts of skill development which encompass the development of occupational clusters and individualized instruction.

The Clerical Skills Lab is a program designed to prepare students for jobs as clerical workers. The instructional program takes place in a simulated office setting which provides students with modern office machines and audio-visual learning equipment. The students prepare for job entrance via individualized instructional packets which help them to acquire the necessary skills. These skills are then put to use in a simulated office experience program which utilizes work-flow procedures for a simulated company.

For students who elect the metals or graphic communications clusters, exposure to the following shops over a one-year period, with specializations taking place at a subsequent period, will occur. Metals shops are: foundry, welding, machine shop and sheet metal. Graphic communications shops are: hand composition, letterpress, offset press, linotype, offset camera and commerical art.

Metals cluster pupils in the tenth grade will spend 10 weeks in the foundry shop, 10 weeks in the welding shop, 10 weeks in the machine shop and 10 weeks in the sheet metal shop. In the 11th grade pupils will have the opportunity to specialize. Based on the job market and his career desires, the pupil will increase his skills in the selected area. The pupil will then participate in a school-work program which will hopefully lead to full-time employment with his or her cooperative employer. After a metals cluster student has completed his 10th grade program, his progress will be evaluated. The coordinator of the shop in which the student wishes to spend his 11th and 12th years must give that student graduation credit for his 10th grade shops. It is the responsibility of the trade coordinator to require the progress committee to change the students' school records showing the new shop program.

To meet the final objective, job placement efforts have already begun which will be expanded to include a larger number of students.

John Maier

THE SCHOOL DISTRICT OF PHILADELPHIA
BOARD OF EDUCATION
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MATTHEW W. COSTANZO
Superintendent of Schools

STANLEY B. COHEN
Director
Skills Centers

Executive Director
Career Education

October 28, 1974

Dear Parent or Guardian:

Your son or daughter has made application and has been selected to participate in a Career Education Program at the Dobbins AVTS. This program requires changing the students present shop assignment to involve them in one of the following:

METALS CLUSTER - Sheet Metal, Welding, Foundry, Machine Shop

COMMUNICATIONS CLUSTER - Printing, Press Work, Linotype, Commercial Art, Technical Typing

CLERICAL SKILLS LABORATORY - Clerical, Office Practice, Typing, Key-punch, Bookkeeping.

The students will obtain experiences in a variety of shops, within a cluster, during the 10th grade and will specialize in the field of their choice in their Junior year.

This is a new concept that is federally funded. The School District feels this will give the participant a better opportunity for job placement in the future, that has not been available in previous programs.

If there are any questions please feel free to contact me at the Dobbins AVTS BA 9-6800. Sign and return the attached permission slip.

Very truly yours,

John Maier

John Maier,
Project Coordinator

JM:gl

CLUSTER PROGRAM
SKILL MASTERY CHECK SHEETS

STUDENT NAME_____ BOOK#_____

DATES FROM_____TO_____

S	U	LINOTYPE
		1. Safety procedures
		2. Work with others - take orders and carry them out
		3. Follow written instructions
		4.Clearing of a Linotype Machine (daily maintenance)
		5. Preventative maintenance
		6. Operation of Linotype Maching
		7. Operation of Linotype Machine (machine operation and casting sequence)
		8. Operation of Low Slugger
		9. Knoweledge of differences between Linotypes and Intertype Machin
		10. Remelting of type metal
		11. Care and maintenance of linotype matrices

TEACHER COMMENTS

Teacher signature

STUDENT NAME _____ BOOK# _____

DATES FROM _____ TO _____

COMMERICAL ART

1. Safety procedures
2. Work with others - take orders and carry them out
3. Follow written instructions
4. Art background - emphasis on design and mechanical drawing
5. Use of art tools and media
6. Knowledge of all artist's equipment for various jobs
7. Draw and paint illustrations
8. Knowledge of reproduction equipment
9. Knowledge of relationship between artist and printer
10. Lettering - knowledge of different lettering designs

TEACHER COMMENTS

_____
Teacher signature

STUDENT NAME:_____ BOOK#_____

DATES FROM_____ TO_____

S	U	HAND COMPOSITION
		1. Safety procedures
		2. Work with others - take orders and carry them out
		3. Follow written instructions
		4. Set type by hand
		5. Pull proofs on proof press
		6. Proof-read using correct proof marks and act as copy-holder
		7. Correct errors in type set by an other student
		8. Operate machine - set Ludlow Type
		9. Distribute hand-type
		10. Operate Repro Press for reproduction proofs
		11. Name and identify different families of type faces and knew when they should be used
		12. Operate saw for cutting spacing materials and make-up jobs

TEACHER COMMENTS

_____
Teachers signature

STUDENT NAME:_____ BOOK#_____

DATES FROM_____TO_____

S	U	OFFSET PRESS
		1. Safety procedures
		2. Work with others - take orders and carry them out
		3. Follow written instructions
		4. Operation of Multilith Press 1250
		5. Maintenance of same press
		6. Knowledge of offset inks and papers
		7. Operation of Davidson Offset Press and Maintenance
		8. Inking and cleaning of offset press rollers and blankets
		9. Paper cutter operations for paper and card stock
		10. Care and use of printing plate before running on press

TEACHER COMMENTS

_____
Teacher signature

COMMUNICATIONS CLUSTER

STUDENT NAME:_____ BOOK#_____

DATES FROM_____ TO_____

LETTERPRESS

S	U	
		1. Safety procedures
		2. Work with others - take orders and carry them out
		3. Follow written instructions
		4. Lock-up type in Chase for printing
		5. Operate and feed a Chandler & Price Job Press
		6. Use wooden and metal furniture in locking form and proper use of quoins
		7. Pack press for running different types of paper
		8. Make ready for funning half-tons
		9. Maintenance of press (oiling, greasing, etc.)
		10. Scoring stock for folding
		11. Knowledge of type, paper and ink specifications

TEACHER COMMENTS

Teacher signature

METAL CLUSTER

STUDENT NAME: _____ BOOK# _____

DATES: FROM _____ TO _____

FOUNDRY

U	A. Safety procedures in the foundry
	1. To wear stell toe shoes and long sleeve shirts
	2. How to blow sand away from eyes
	3. Correct way to lift, bend and turnover mould
U	B. Pouring procedures
	1. Correct equipment and how to wear it
	2. Correct way to pour mould
	3. Correct way to carry molten metal
	4. What to do in case molten metal busts out
	5. Correct way to get rid of excess metal
U	C. Molding procedures
	1. How to mix snad
	2. How to make simple flat back mould
	3. How to make cores
	4. How to use cores
	5. How to make two part jobs
	6. How to make floor jobs
	7. How to make floor jobs with cores
	8. How to gate rison and part jobs
	9. How to make hidden part jobs
	10. How to degate and clean jobs
	11. How to use grinding wheel and sand-blaster

TEACHER COMMENTS:

Teacher Signature

METALS CLUSTER

STUDENTS NAME: _____ BOOK # _____

DATES: FROM _____ TO _____

SHEET METAL

S	U	
		a. Safety procedures
		b. Work with others
		c. Interpreting sketches and written orders
		d. Knowledge of metal characteristics
		e. Operation of bending and forming machines
		f. Operation of cutting machines
		g. Bevelopment of basic patterns
		h. Shop organization and procedures
		i. Fabrication of air handling systems
		j. Introduction to all phases of pattern development

TEACHER COMMENTS:

_____
Teacher Signature

METALS CLUSTER

STUDENT NAME: _____ BOOK# _____

DATE: FROM _____ TO _____

WELDING

PART I OXY-ACETYLENE PROCESS

S	U	Orientation:
		1. Oxy-acetylene welding defined
		2. Brief history of process
		3. Identifying potential hazards
		4. General scope of application
		5. Opportunities in trade (motivation)
		6. Welding terminology

S	U	UNIT A -- ASSEMBLING AND SETTING UP EQUIPMENT
		1. Safety precautions
		2. Functions of regulators, hoses, torch
		3. Properties of oxygen and acetylene
		4. Safe and proper handling of cylinders
		5. Adjusting pressures

S	U	UNIT B -- LIGHTING AND ADJUSTING TORCH
		1. Study of neutral, carbunizing, oxidizing flames
		2. Backfires, flashbacks, - cause and corrective measures

S	U	UNIT C -- ADJUSTING REGULATORS
		1. Function of regulator screw
		2. Opening and closing cylinders

S	U	UNIT D -- TOPCH MANIPULATION
		1. Proper method of holding torch
		2. Position and motion of torch
		3. Carrying puddles without filler rod
		4. Laying beads with a filler rod
		5. Angle of rod in relation to angle of torch
		6. Travel speed.

S	U	UNIT E -- RELATED INSTRUCTIONS (LECTURE AND/OR DEMONSTRATION)
		1. Testing for leaks
		2. Selection of filler rods
		3. Importance of keeping welding area clean
		4. Importance of wearing proper clothing

TEACHER COMMENTS:

Teacher Signature _____

STUDENT NAME: _____ BOOK# _____

DATES FROM _____ TO _____

WELDING

PART II ARC WELDING

S	U	
		Orientation
		1. Arc welding defined
		2. Scope of application
		3. Employment opportunities (motivation)
		4. Safety precautions
		5. Welding terms specific to arc welding
S	U	UNIT A -- MACHINES AND EQUIPMENT
		1. D.C. machines
		2. A.C. machines
		3. Rectifiers
		4. Cable (ground-electrode)
		5. Electrode holder
S	U	UNIT B -- ELECTRODES
		E6010
		E6012
		Polarity factor
S	U	UNIT C -- PERSONNAL EQUIPMENT
		1. Face shield (inserting & removing dark glass)
		2. Importance of wearing; work cap, work shirt & pants with no cuffs, work shoes, gauntlet type gloves.
		3. Safety glasses
S	U	UNIT D -- ESSENTIALS FOR PROPER WELDING PROCEDURES
		1. Correct electrode size
		2. Correct current
		3. Correct arc length
		4. Correct travel speed
		5. Correct electrode angle
S	U	UNIT E -- ADJUSTING MACHINE
		1. Setting desired polarity switch
		2. Setting control unit for desired amperage
		3. Turning "on" switch
S	U	UNIT F -- STRIKING AN ARC
		1. Tapping method
		2. Scratching method

PART II ARC WELDING (continued)

S	U	
		UNIT G -- RUNNING SHORT BEADS
		UNIT H -- RUNNING CONTINUOUS BEADS
		UNIT I -- WEAVING BETWEEN TWO (2) STRAIGHT BEADS

TEACHER COMMENT:

Teacher Signature

METALS CLUSTER

STUDENT NAME: _____ BOOK# _____

DATES FROM _____ TO _____

MACHINE SHOP

S	U	
		Safety Procedures
		1. Eye protection
		2. Shoes and clothing
		3. Machine guards
		Good Housekeeping
		1. Tool crib care
		2. Keeping equipment clean and oiled
		3. Keeping floors clean of dirt and oil
		Reading Simple two (2) view drawings
		Reading and using a scale (ruler) and micrometer
		1. Turning to fractional diameters
		2. Turning to decimal diameters
		3. Chasing a thread to fit a gauge
		Setting up an engine lathe for...
		1. Turning (tool grinding)
		2. Threading
		3. Grooving
		4. Chamfering
		Setting up a shaper
		1. Machining a work-piece square and to size
		2. Checking with a solid square
		Using layout tools
		1. Combination square
		2. Protractor
		3. Scriber
		Using hand tools
		1. Hammers
		2. Prick and centre punches
		3. Scribers
		4. Hack saws (also power)

MACHINE SHOP (continued)

S	U	
		Surface grinder
		1. Wheel dressing
		2. Flat grinding
S	U	
		Simple drill press operation
S	U	Do-all bandsaw
		1. Welding a bandsaw blade
		2. Some contour sawing

TEACHER COMMENTS

Teacher Signature